

A NEW MEXICAN SPECIES OF *HOMIOISTERNUS* (COLEOPTERA: MELOLONTHIDAE; RUTELINAE)

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Abstract.—A new Mexican species of *Homoioisternus* Ohaus is described and illustrated. Character states of the new species appear to be intermediate between species of *Homoioisternus* Ohaus and *Plesioisternus* Morón. We discuss taxonomically useful characters for these genera and provide a key to the genera and species of *Mesosternus* Morón, *Plesioisternus* and *Homoioisternus*.

The subtribe Heterosternina (Rutelinae) consists of 11 genera and 16 species which are distributed from northwestern and northeastern Mexico to Ecuador. The highest taxonomic richness of the group is in Mexico with nine genera and 13 species (Morón, 1983, 1987; Morón and Howden, 1992).

Genera of this subtribe have been largely characterized by sexually dimorphic characters, especially of the male hind legs. The genus *Plesioisternus* Morón currently contains to *P. setosus* Morón and *P. punctatus* Morón and Howden. According to Morón (1983), *Plesioisternus* is the sister genus to *Macropoides* Guérin-Meneville. Both genera exhibit sexual dimorphism in hind legs. Morón (1987) suggested that *Homoioisternus beckeri* Ohaus is closely related to the genus *Mesosternus* Morón based on the absence of sexual dimorphism.

Here we describe a new species of *Homoioisternus*, and comment on its character states that appear to be transitional between the characters states of *Homoioisternus* and *Plesioisternus*. We propose new diagnostic characters for these genera and a key to separate the species of *Mesosternus*, *Plesioisternus* and *Homoioisternus*.

Homoioisternus canorum, new species (Figs. 1, 5, 8, 11, 14, 17, 20, 23, 26, 29)

Description: Holotype male. Length 34.5 mm; maximum width (at basal 3/5 of elytra) 18.8 mm. Body oval; dorsal color and legs tan, lateral regions of pygidium and tarsi slightly darker, ventral color reddish brown. Clypeus semitrapezoidal, apex rounded, margins moderately reflexed, disc distinctly convex; clypeus with dense and moderate punctures, punctures becoming confluent laterally; frontoclypeal suture fine, almost straight and weakly pigmented; frons with sparse punctures on sides; antennal club subequal to stem; mentum with apical margin broadly emarginate and a weak notch at center; mandibles with an external, distinct preapical tooth and three acute teeth on cutting edge; ratio of cephalic length/pronotal length 0.60.

Pronotum with anterior angles slightly obtuse; pronotal basal bead complete; central third of pronotum with punctures small and sparse, gradually becoming larger and denser at sides but not confluent. Elytra feebly swollen at central third; sides slightly recurved at the metacoxal level; apex rounded; elytral disc with dense punc-

tures and some shallow rugae, punctures slightly larger than those of head; elytral sutures and lateral edges with narrow brown margin. Meso- and metasternum clothed with dense, long, yellowish setae; mesosternal process very short, shape subtriangular with blunt point and almost vertical in lateral view. Abdomen longer at middle than meso- and metasternum combined (1.1:1.0); longitudinal central third of abdominal sternites with moderately dense and short setae, denser and longer laterally; abdominal sternites 2–4 slightly sinuate at apex. Pygidium wide, evenly convex; surface very rugose with dense, long, yellowish setae.

Protarsus with inner claw strongly thickened and split apically; protarsomeres 1–4 wider than long (Fig. 1). Mesotibiae narrower than metatibiae; mesotarsi short and thickened; mesotarsal outer claws moderately curved with teeth weakly separated (Fig. 5). Metacoxae not prominent; posterior border of metatrochanter without projections and with dense setae, apex produced to same level of posterior border of metafemur (Fig. 8); metafemora moderately enlarged and swollen, posterior process not strongly produced, situated at about basal $\frac{2}{5}$ of posterior border (from apex of trochanter) (Fig. 8); metatibiae moderately bent with moderately dense setae on the internal face (Fig. 11), apex with four minute bristles on ventrolateral edge and produced to apex of first tarsomere; metatibial spurs slender, long, flattened, with blunt apex (Fig. 14); metatarsi short and thickened; metatarsal outer claws slightly curved with teeth moderately separated (Fig. 17). Male genitalia with parameres narrowed toward apex, tip scarcely bent and rounded (Figs. 20, 23); aedeagus long, covered with fine, dense setae.

Allotype female. Length 31.8 mm; maximum width (at middle of elytra) 16.7 mm. Similar to male except as follows: body oval-elongate, pygidium completely tan; clypeal margins more reflexed, clypeal disc slightly convex. Punctuation of head denser; emargination and notch of mentum shallower; ratio of cephalic length/pronotal length 0.67; pronotal basal bead lacking in front of central eighth of base of scutellum; pronotum less transverse than male, pronotal punctation denser but not confluent; elytral disc without rugae, punctures similar in size to those of head; abdomen longer at middle than meso- and metasternum combined (1.3:1.0), central third of abdominal sternites with setae denser; inner claw of protarsus not thickened and widely toothed; meso- and metatarsi long and narrow with outer claws widely toothed; metatrochanter produced weakly beyond posterior border of metafemur (Fig. 26); metafemora not enlarged or swollen, posterior process weaker than male (Fig. 26); metatibiae straight, shorter and stouter, apex not extended, internal face with sparse setae, ventrolateral edge of apex with eight minute to small bristles or setae; internal metatibial spur with apex rounded (Fig. 29).

Variation. Length of males varies from 30.1 mm to 32.2 mm and maximum width (at basal $\frac{2}{5}$ of elytra) varies from 17.2 mm to 17.6 mm; length of females varies from 29.1 mm to 32.1 mm and maximum width (at middle of elytra) varies from 15.5 mm to 16.8 mm. Variation is mainly noted for (common state is mentioned first): body shape (both sexes) oval to oval-elongate, pygidium tan to tan with lateral regions reddish; clypeal apex varies from rounded to weakly truncate, margins moderately to slightly reflexed, disc distinctly to slightly convex and with punctures dense to very dense; medial notch of apical margin of mentum indistinct to lacking; ratio cephalic length/pronotal length 0.58 to 0.65; pronotal anterior angles slightly obtuse to right-angled, pronotal basal bead lacking in front of central eighth of base of

scutellum to complete, discal punctures small to moderate and sparsely to moderately dense; elytra feebly swollen to evenly convex, discal punctures sparse to dense and larger or similar in size to those of head, with or without rugae; mesosternal process subtriangular to rounded at apex and declivous to vertical in lateral view; ratio of abdominal length—meso-metasternal length 1.1 to 1.4; abdominal sternites in longitudinal central third with setae dense to sparse in males and dense to very dense in females; ventrolateral edge of metatibial apex with 4–8 minute bristles or setae; outer claws of metatarsi in males slightly or moderately curved.

Type material: Holotype male: México, Guanajuato, Guanajuato, Sierra de Santa Rosa, Cañada de la Virgen, Alt. 2,330 m, 5-VII-95, luz fluor., J. Cano col. Allotype female and six males and two females paratypes same data as holotype, except: 6-VII-95, dentro de tronco podrido de aliso, M.Cano y L. Delgado cols. One female paratype same data as anterior, except: Sierra de Santa Rosa, Pícones, Alt. 2,250 m, 31-VIII-95, luz fluor., J. Cano col.

Holotype and allotype deposited in the Instituto de Ecología, A.C. (Xalapa, Mexico); paratypes deposited in the collections of Museum für Naturkunde der Humboldt-Universität zu Berlin (Germany), H. & A. Howden (Ottawa, Canada), M.A. Morón (Xalapa, Mexico), J.P. Beraud (Cuernavaca, Mexico), J. Blackaller (D.F., Mexico) and L. Delgado (D.F., Mexico).

Etymology: We take pleasure in naming this species after the family Cano, who live in the Sierra de Santa Rosa. The Cano family first collected this species. They assisted and showed hospitality to senior author in his collecting trips to this region.

Distribution: *Homoio sternus canorum* is known from two close localities situated at the Sierra de Santa Rosa, in the central state of Guanajuato, Mexico (Fig. 31). Both localities have altitudes of 2,250 m to 2,330 m and a subhumid temperate climate. The habitat is mature, undisturbed oak-alder forest which occupies the wet ravines (Estrada, 1996). The species was not present in disturbed oak forests, early succession forests, or dry forests in the same region.

The region that *H. canorum* inhabits is located between the distributional ranges of *H. beckeri* and *Plesio sternus* spp. (Fig. 31). The subhumid climate with a long dry season in combination with the oak forest of this region are similar habitat requirements for *H. beckeri*. The genus *Plesio sternus*, however, requires a humid climate with a short dry season and cloud forest habitat.

DISCUSSION OF TAXONOMIC CHARACTERS FOR *HOMIOIO STERNUS* AND *PLESIO STERNUS*

Homoio sternus canorum is a species that relates the genera *Homoio sternus* and *Plesio sternus*, since it exhibits most character states intermediate between both genera (Table 1). *Homoio sternus canorum* shares with *Plesio sternus* the character states present in 2a, 9a, 10a and 11a, and with *H. beckeri* those present in 5a and 13a (Table 1). However, character states of 2a and 5a represent small differences of degree, and the characters 9a, 10a, 11a and 13a refer to sexual dimorphism, just as the characters 1b and 2b (shared between *H. canorum* and *Plesio sternus*, Table 2) and 4c and 5c (shared between *H. canorum* and *H. beckeri*, Table 3). The character states of *H. canorum* present in 1a, 3a, 4a, 6a, 7a, 8a and 12a are shared with both *H. beckeri* and *Plesio sternus*; to note that characters 4a and 6a were previously used for separating these genera (cf. Morón and Howden, 1992).

Table 1. Transitional character states of *Homioiosternus canorum*.

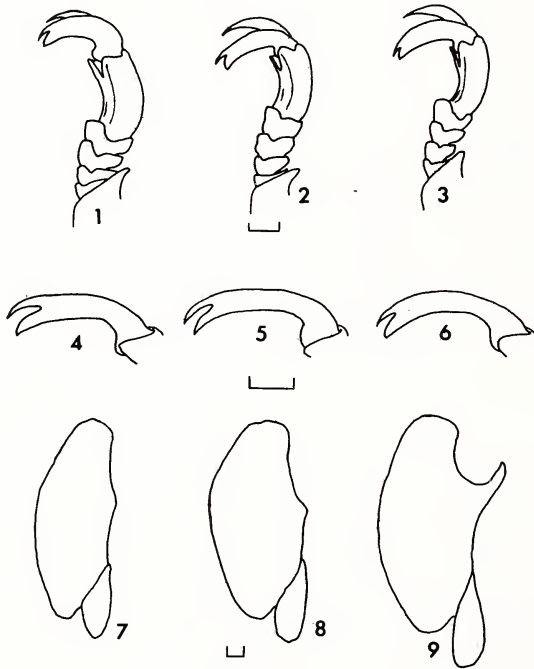
No.	Character		
	<i>H. beckeri</i>	<i>H. canorum</i>	<i>Plesioiosternus</i> spp.
1a	Apex of clypeus	Distinctly to weakly truncate	Rounded to weakly truncate
2a	Clypeal margins	Distinctly reflexed	Moderately to weakly truncate
3a	Clypeal disc	Flat to slightly convex	Moderately to slightly reflexed
4a	Punctuation on clypeus	On disc little dense, on sides separate to confluent	Distinctly to slightly convex On disc little dense to very dense, on sides confluent to rugose
5a	Ratio cephalic length/pronotal length	0.52-0.61	0.70-0.71
6a	Elytral disc	With dense punctures, confluent or not, larger than those of head; with rugae	With sparse to dense punctures, not confluent, similar or smaller than those of head; without rugae
7a	Setae on central third of sternites	Sparse to little dense (δ & ♀)	Dense to sparse (δ), dense to very dense (♀)
8a	Ventrolateral edge of apex of metatibiae	8-11 bristles or setae, most of them very short	1-5 bristles or setae, most of them minute
9a	Metatibiae δ	Almost straight; apex up to the half of first tarsomere (Fig. 10)	Strongly bent; apex up to the apex of second tarsomere (Fig. 12)
10a	Setae on internal face of metatibia δ	Sparse to little dense	Very dense
11a	Mesotarsal outer claws δ	Slightly curved; teeth moderately separate (Fig. 4)	Distinctly curved; teeth closer (Fig. 6)
12a	Metatarsal outer claws δ	Slightly curved; teeth widely separate (Fig. 16)	Moderately curved; teeth closer (Fig. 18)
13a	Metafemoral process ♀	At basal $\frac{1}{3}$ of posterior edge (Fig. 25)	At middle of posterior edge (Fig. 27)

Table 2. Character states shared between *Homoio sternus canorum* and *Plesio sternus*.

No.	Character	<i>H. canorum</i> and <i>Plesio sternus</i>	<i>H. beckeri</i>
1b	Meso and metatarsi ♂	Short and thickened	Long and narrow
2b	Metafemora ♂	Enlarged (Figs. 8, 9)	Narrow (Fig. 7)

The character 2c (Table 3) has been largely used to separate the genera of this subtribe into two groups, one with distinct and complete or briefly broken pronotal basal bead (*Homoio sternus* and *Plesio sternus*) and another with pronotal basal bead absent or only slightly impressed near the posterior angles (Morón, 1983, 1987); discovery of a second species of *Plesio sternus* and additional specimens of *P. setosus* with absent or feebly marked pronotal basal bead led to redefine the character states for *Plesio sternus* (Morón and Howden, 1992). In our opinion, this character should be secondarily used to separate *Homoio sternus* and *Plesio sternus*, due to its scarcely discernible character states. On other hand, similar shapes of male genitalia of the species of both genera not provide differences at the generic level (Figs. 19–24).

We alternatively propose the characters 1c and 3c to recognize these genera (Table



Figs. 1–9. *Homoio sternus* and *Plesio sternus* spp. 1–3. Male protarsus. 1) *H. canorum*; 2) *H. beckeri*; 3) *P. setosus*. 4–6. Male mesotarsal outer claw. 4) *H. beckeri*; 5) *H. canorum*; 6) *P. setosus*. 7–9. Male metatrochanter and femur (anterior to left). 7) *H. beckeri* (type); 8) *H. canorum*; 9) *P. setosus*. Scale = 1 mm.

Table 3. Character states of *Homoiosternus* and *Plesiosternus*.

No.	Character	<i>Homoiosternus</i>		<i>Plesiosternus</i>
1c	Anterior angles of pronotum	Slightly obtuse to right (♂ ♀)		Distinctly (♂) or slightly acute (♀)
2c	Pronotal basal bead	Complete or at most lacking in front of central third of scutellum		Absent or present up to the base of scutellum
3c	Metatibial spurs	♂ slender, long and flattened (Figs. 13, 14) ♀ external elongate, internal narrow (Figs. 28, 29)		♂ stout, short and conical (Fig. 15) ♀ external oval, internal broad (Fig. 30)
4c	Pygidium ♂	Evenly convex		Basal half convex, apical half concave
5c	Metafemoral process ♂	Not modified (Figs. 7, 8)		Spiniform (Fig. 9)

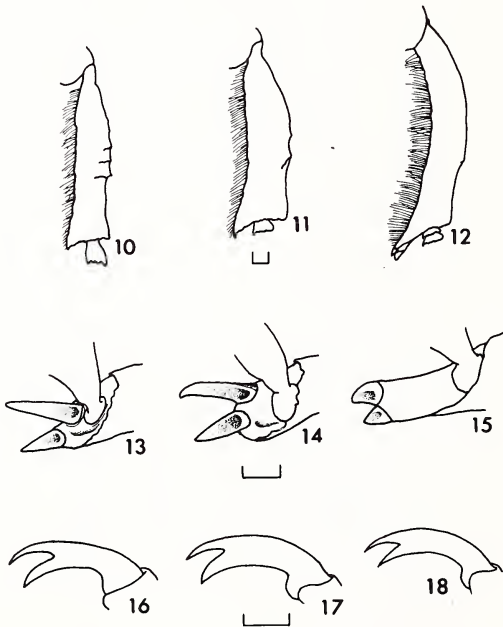
Table 4. Unique character states of *Homoiosternus canorum*.

No.	Character	<i>H. beckeri</i>	<i>H. canorum</i>	<i>Plesio sternus</i> spp.
1d	Color of pygidium, femora and tibiae	Reddish brown to brown	Mostly tan	Brown (pygidium), mostly brown with tan (legs)
2d	Protarsi and inner claw ♂	Moderately thickened (Fig. 2)	Strongly thickened (Fig. 1)	Moderately thickened but longer (Fig. 3)

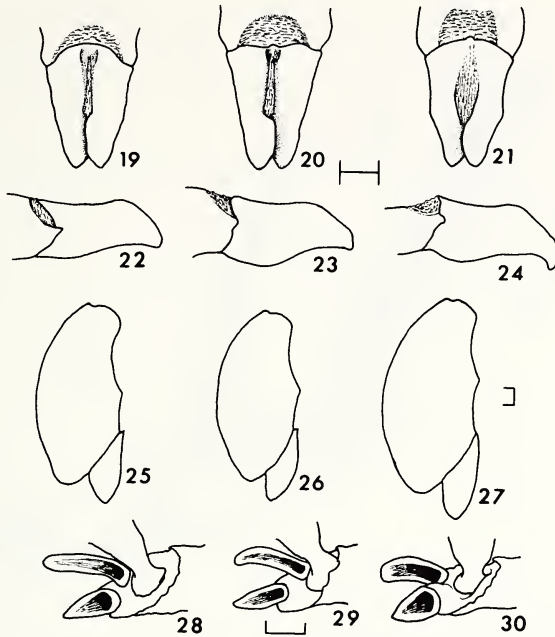
3), these characters are based on shape of structural features and, thus provide greater reliability at the generic level. Nevertheless, a future phylogenetic analysis and, perhaps, the discovery of new species might support the presence of only one lineage.

The unique character states of *H. canorum* (Table 4) only represent interspecific variation, since these refer to color and degree of thickness; others characters useful to separate the two species of *Homoiosternus* are 2a (not-dimorphic) and 9a, 10a, 11a, 1b and 2b (sexually dimorphic) (Tables 1 and 2).

We propose the following key to separate these genera and species together with *Mesosternus halfferi* Morón, a species previously related to these taxa (Morón,



Figs. 10-18. *Homoiosternus* and *Plesio sternus* spp. 10-12. Male metatibia. 10) *H. beckeri* (type); 11) *H. canorum*; 12) *P. setosus*. 13-15. Male metatibial spurs. 13) *H. beckeri* (cotype); 14) *H. canorum*; 15) *P. setosus*. 16-18. Male metatarsal outer claw. 16) *H. beckeri*; 17) *H. canorum*; 18) *P. setosus*. Scale = 1mm.



Figs. 19–30. *Homoiosternus* and *Plesiosternus* spp. 19–24. Parameres of male genitalia (19–21, dorsal view; 22–24, lateral view). 19, 22) *H. beckeri* (type); 20, 23) *H. canorum*; 21, 24) *P. setosus*. 25–27. Female metatrochanter and femur (anterior to left). 25) *H. beckeri* (coty-
 type); 26) *H. canorum*; 27) *P. setosus*. 28–30. Female metatibial spurs. 28) *H. beckeri* (coty-
 type); 29) *H. canorum*; 30) *P. setosus*. Scale = 1 mm.

1987); however there is necessary a future redefinition of the last genus on basis of new not-dimorphic characters. This key replaces couplets 4 and 5 in Morón’s (1987) key to the Heterosternina.

- 1. Ventral color with metallic green reflections, femora and tibiae with iridescent tinges. Pronotal punctation strongly contrasting: on central third fine and sparse and on lateral thirds reticulate-rugose *Mesosternus halfieri*
- 1’. Ventral color and legs shining or dull but without metallic reflections and iridescent tinges. Pronotal punctation gradually becoming denser and larger to sides 2
- 2. Anterior angles of pronotum obtuse or right. Male metatibial spurs slender, long and flattened; female metatibiae with the external spur elongate and the internal one narrow *Homoiosternus* . . . 3
- 2’. Anterior angles of pronotum acute. Male metatibial spurs stout, short and conical; female metatibiae with the external spur oval and the internal one broad . . . *Plesiosternus* 4
- 3. Color of pygidium, femora and tibiae reddish brown or brown. Clypeal margins distinctly reflexed *H. beckeri*
- 3’. Color of pygidium, femora and tibiae mostly tan. Clypeal margins moderately to slightly reflexed *H. canorum*
- 4. Pronotal and elytral punctures sparse and small. Outer apex of metatrochanter lacking tooth *P. setosus*



Fig. 31. Distribution of *Homoiosternus* and *Plesiosternus* in relation to the Mexican mountains. a = *H. beckeri*. e = *H. canorum*. o = *P. setosus*. u = *P. punctatus*.

- 4'. Pronotal and elytral punctures dense and moderately large. Outer apex of metatrochanter with small but distinct tooth *P. punctatus*

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LITERATURE CITED

Estrada, A. 1996. Estudio preliminar de la Avifauna de la Sierra de Santa Rosa, Guanajuato, México. Thesis. Universidad Nacional Autónoma de México, México, 74 pp.
 Jameson, M. L. 1990. Revision, phylogeny and biogeography of the genera *Parabyrsopolis* Ohaus and *Viridimicus*, new genus (Coleoptera: Scarabaeidae: Rutelinae). *Coleopt. Bull.* 44:377-422.
 Morón, M. A. 1983. A revision of the subtribe Heterosternina (Coleoptera, Melolonthidae, Rutelinae). *Folia Entomol. Mex.* 55:31-101.
 Morón, M. A. 1987. Adiciones a los Heterosternina (Coleoptera: Melolonthidae, Rutelinae). *Folia Entomol. Mex.* 73:69-87.

- Morón, M. A. and H. F. Howden. 1992. A second species of *Plesiosternus* Morón with notes on other Heterosternina (Coleoptera: Scarabaeidae: Rutelinae). *Coleopt. Bull.* 46:15–19.
- Ratcliffe, B. C. and M. L. Jameson. 1989. A synopsis of the genus *Areoda* (Coleoptera: Scarabaeidae: Rutelinae). *Coleopt. Bull.* 43:135–144.

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